

GOVERNMENT POLYTECHNIC, PUNE
(An Autonomous Institute of Govt. of Maharashtra)

Programme	:	Diploma in ET/CE/EE//ME/MT/CM/IT/DDGM
Programme Code	:	01/02/03/04/05/06/07/08/16/17/21/22/23/24/26
Name of Course	:	Electronics Instrumentation
Course Code	:	ET 384

Teaching Scheme:

	Hours /Week	Total Hours
Theory	03	48
Practical	02	32

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests, each of 60 minutes	3 Hrs.	3 Hrs.	--	--
Marks	20	80	25	--	--

Course Rationale:

Electronic Technicians are required to handle measuring Instruments as tool, frequently. Hence, knowledge and hands on experience of these instruments is essentials.

Course Objectives:

After studying this course, the student will be able to

- To understand Static & Dynamic Characteristics of Measuring Systems.
- To know the construction of the instruments.
- To understand the principles and operation of different measuring instruments.
- To understand Measuring principles of Digital Instruments.
- To understand Measuring principles of AC&DC Bridges.
- Observing reading and interpreting the values from different meters.

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Course Content:

Chapter No.	Name of Topic/Sub topic	Hrs	Marks
1.	Basics of Measurement:		
	Contents <ul style="list-style-type: none"> • Introduction to measurement systems. • Generalized block dig. Of instrumentation system. • Classification of Instruments: Absolute , Secondary Instruments • Definitions of Static characteristics of Instruments: (Accuracy, Precision, Sensitivity, Resolution, Static error, Reproducibility, Drift, Dead Zone) • Definitions of dynamic characteristics of Instruments: (Speed of response, Lag, fidelity, Dynamic error) • Types of Errors- Gross, Systemic, Random • Definition of Standards and their classification: (International, Primary, Secondary) • Calibration: Definition, Need of calibration. 	6	10
2.	Analog DC and AC Meters		
	<ul style="list-style-type: none"> • Classification of analog ammeter and voltmeter • Working principle and construction of PMMC instruments • Analog DC Ammeter: Shunt resistor type, Ayrton Shunt type • Analog DC Voltmeter: Multiplier voltmeter • Multirange voltmeter: Voltmeter sensitivity, loading effect. • Analog AC Voltmeter (No derivation)- Half Wave rectifier type, Full wave rectifier type, Multirange type • Analog AC Ammeter • Analog multimeter: Electrical circuit diagram, operation 	08	14
3.	Digital Meters		
	Concepts of ADC & DAC (Review) (No marks) <ul style="list-style-type: none"> • Advantages and Disadvantages of Digital Instruments and comparison with analog instruments • Block diagram, operation and applications of <ol style="list-style-type: none"> a. Digital Frequency meter b. Digital Voltmeter c. DMM (Ramp type DVM, Integrating type DVM, Successive approximation type DVM, Dual slope type DVM). d. LCR, Q-Meter 	08	14

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4.	AC/DC Bridges & Their Applications		
	<ul style="list-style-type: none"> • Bridge balance condition for DC bridge • Study of following Dc bridges : <ul style="list-style-type: none"> • Whetstone's bridge • Kelvin's bridge • Bridge balance condition for AC bridge • Study of following AC bridges. <ul style="list-style-type: none"> a. Capacitance comparison bridge b. Inductance comparison bridge c. Maxwell's bridge. d. Hay bridge. e. Schering's bridge f. Wien's bridge. • Wagner ground connection. 	08	14
5.	Oscilloscope		
	<p>Contents</p> <ul style="list-style-type: none"> • CRO: Basic Block diagram and function of each block • CRT: Construction and working • Vertical Deflection System –Block diagram and operation • Horizontal deflection system – Block diagram and operation • Function of delay line • Applications of CRO: <ul style="list-style-type: none"> a. Time & frequency measurement b. Voltage measurement c. Lissagous patterns for Phase and Frequency measurement • Concept, block diagram and Operation of: Single beam dual trace & Dual beam Dual Trace CRO • Block diagram, operation and applications of digital storage oscilloscope(DSO) 	12	18
6.	Signal Generator and Wave Analyzer		
	<p>Contents</p> <p>Signal Generator:</p> <ul style="list-style-type: none"> • Definition and need of signal generator • Block diagram, operation and applications of : <ul style="list-style-type: none"> a) AF and RF type signal generator b) Function generator <ul style="list-style-type: none"> • Wave analyzers: • Definition and need of waveform analyzer • Block diagram, operation and applications of : <ul style="list-style-type: none"> a) Logic analyzer 	06	10

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	b) Spectrum analyzer		
		TOTAL	48
			80

List of Practical/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment
1.	Measure DC Voltage & DC Current using PMMC instruments.
2.	Extension of range of Ammeter & voltmeter
3.	Measurement of R.L.C using LCR, Q meter.
4.	Study front panel controls of specification of typical CRO.
5.	Measure frequency, voltage, phase difference (by time measurement) using CRO.
6.	Testing of component using CRO.
7.	Using Lissagous pattern find frequency & phase difference of unknown signal.
8.	Study & use of Digital Storage Oscilloscope.
9.	Study of wheatstone's bridge for measurement of unknown resistance.
10.	Measurement of unknown capacitance using bridge.
11.	Measurement of unknown inductance using bridge
12.	Measure frequency & voltage of the different o/p waveforms of function generator.
13.	Study & use of signal Generator
14.	Study & use of pulse generator.

Minimum 10 practicles should be performed.

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Measuring Systems & Characteristics of Instruments.	Class room teaching
2.	Analog DC and AC Meters	Class room teaching & Laboratory work
3.	Digital Meters.	Class room teaching & Laboratory work
4.	Bridges	Class room teaching & Laboratory work
5.	Oscilloscope.	Class room teaching & Laboratory work
6.	Signal Generator and Analyzer.	Class room teaching & Laboratory work

Text Books:

Sr. No	Author	Title	Publication
1.	Modern Electronic Instrumentation & Measurement Techniques	W.D. Cooper	Pearson Education, New Delhi
2.	Electronic Instruments	H S Kalsi	Tata Mc Grow Hill
3.	Electronics Instrumentation & measurement Systems	J.G.Joshi	Khanna Publication

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Reference Books:

Sr. No	Author	Title	Publication
1.	Electrical & Electronic Measurements & Instrumentations	A.K. Sawhney	Dhanpat Rai & Co.



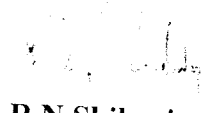
Learning Resources:

Reference manuals, Instrumentation Hand book by Liptak, Instrumentation Hand book by Anderson, Technical Reference book of Instruments, Service Manuals of Instruments, Handouts, O.H.P. Transparencies / L.C.D. Projector.

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Measuring Systems & Characteristics of Instruments.	4	4	2	10
2.	Analog DC and AC Meters	4	6	4	14
3.	Digital Meters.	4	6	4	14
4.	Bridges	2	10	2	14
5.	Oscilloscope.	4	10	4	18
6.	Signal Generator and Analyzer.	2	6	2	10
Total		20	42	18	80

Prepared By:

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